PATENT SPECIFICATION

759,215

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COMPLETE SPECIFICATION

"Improvements in Timing Gears".

We, GENERAL MOTORS CORPORATION, a Company incorporated under the laws of the State of Delaware in the United States of America, of Grand Boulevard in the City of Detroit, State of Michigan, in the United States of America (Assignees of ALLEN LA DUKE EVERITT), do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement.—

This invention relates to timing gears and particularly but not exclusively for internal combustion engines.

In internal combustion engines, and particularly those used in motor vehicles, the construction of timing gears involves problems in relation to noise and durability. Timing gears formed from a single piece of cast iron material have been used, and non-metallic gears made from fabric reinforced plastics have also been proposed for use as timing gears. Cast iron and steel gears are noisy and heavy, and plastic gears are not durable and require replacement at frequent intervals.

An object of the invention is to provide a timing gear assembly which is of a shock absorbing nature whereby noise is reduced during operation of the gear in its normal environment.

The invention provides a timing gear comprising an aluminium ring gear portion and a ferrous hub portion joined by an intermediate annulus of resilient material bonded to each.

The scope of the invention is defined by the appended claims; and how it can be carried into effect is hereinafter particularly described with reference to the accompanying drawings in which:

Fig. 1 is a plan of a timing gear embodying the invention;

Fig. 2 is a section on line 2—2 of Fig. 1;

Fig. 3 is a plan of a segment of another embodiment of the invention;

Fig. 4 is a section on line 4—4 of Fig. 3; and

Fig. 5 is a plan of a segment of another embodiment of the invention.

In the embodiment of Fig. 1 is shown a timing gear 20 having an aluminium ring gear portion 22 formed as an annulus including teeth and a cast iron hub portion 24. The hub portion 24 consists of a rim 26, having a width substantially identical to the width of the ring gear 22, connected to a hub 28 by a spider 30. The hub portion 24 is held to the ring gear portion 22 by an annulus 32 of resilient, preferably elastomeric material interposed therebetween and bonded by cement to both portions 22 and 24.

The elastomer used for the annulus 32 is determined by the use of the gear. In most timing gears, a heat and oil resistant stock must be used. One of these comprises butadiene-acrylonitrile copolymer mixtures with phenolics to strengthen the material. The elastomeric portion is preferably above 50% by weight of the material of the annulus. In place of the butadiene-acrylonitrile copolymer butadiene-styrene copolymers can be used.

In the absence of critical conditions, the elastomeric ring can be made from any material which has the desired and required resilience, for example, natural rubber, butadiene-styrene copolymers, butadiene-acrylonitrile copolymers, polychloroprene, compatible mixtures of any of the above-mentioned materials, or any material which has the required degree of resiliency and which can be bonded firmly to the metal parts to which it is assembled.

The ring gear portion 22 can alternatively be formed of cast iron or of steel.

In some applications of timing gears shearing stress, either during rotation or in thrust, may become of sufficiently high mag-

nitude to be important. In the embodiment of Figs. 3 and 4 the timing gear is specifically designed to resist thrust loads as imposed through the shaft. On the outer rim 26 of the ferrous hub portion 24 is a flange 40 which registers with a groove 42 formed at the inner surface of the aluminium ring gear 22. When the elastomeric annulus 32 than the projected flange 40 and extends entirely around the inner surface of the ring gear 22. The groove 42 is slightly wider is in place, the projection 40 is spaced from the two wall sections of the groove 42 so that when thrust loads are imposed, the projection 40 attempts to move closer to one wall or the other of groove 42. In this position, the rubber between the wall of the groove 42 and the projection 40 is placed under compression rather than shearing stress. The embodiment of Fig. 5 has particular application where a heavy radial load is imposed on the elastomeric annulus during rotation of the gear when it is driving or being driven. An aluminium ring gear portion 52 has notches 54 therein which register with projections 56 carried by a ferrous hub portion 50. The notches 54 are wider than the projections 56 and resilient material 58 is molded therebetween, to form a cushion concentrically locating the ring gear portion 52 with respect to the hub portion 50.

When rotational loads are imposed on the hub or ring gear, there is a tendency toward relative turning movement of the hub portion 50 with respect to the ring gear portion 52 which places the resilient material 58 between the projections 56 and notches 54, in a state of compression.

A combination of the embodiments shown in Figs. 3 and 5 can also be used.

What we claim is:

1. A timing gear formed of an aluminium outer ring portion carrying teeth and a ferrous inner hub portion, the two portions being joined by an annulus of resilient material bonded thereto.

2. A timing gear formed of an aluminium toothed ring gear portion and a ferrous hub portion, the two portions being held together resiliently by an annulus of elastomeric material bonded thereto.

3. A timing gear according to Claim 1 or Claim 2 in which the hub portion or ring portion has an outwardly projecting flange adapted to mate with a groove in the ring portion or hub portion respectively but spaced therefrom by the annulus.

4. A timing gear according to Claim 1 or Claim 2 in which the hub portion has projections adapted to mate with notches in the ring portion but separated therefrom by the annulus.

5. A timing gear according to any of the preceding claims in which the annulus is formed of a heat and oil resistant butadiene-acrylinitrile copolymer mixture strengthened by phenolics.

6. A timing gear according to Claim 5 in which the copolymer mixture is above 50% by weight of the material of the annulus.

7. A timing gear for an internal combustion engine as hereinbefore particularly described and as shown in Figures 1 and 2 of the accompanying drawings.

8. A timing gear for an internal combustion engine as hereinbefore particularly described and as shown in Figures 3 and 4 of the accompanying drawings.

9. A timing gear for an internal combustion engine as hereinbefore particularly described and as shown in Figure 5 of the accompanying drawings.

10. A timing gear for an internal combustion engine having an aluminium outer ring portion carrying teeth and a ferrous hub portion adapted for connection to a shaft, one of said portions having a projection extending generally in the direction of a registering cutout in the other portion and an annulus of elastomeric material bonded to each of said portions and concentrically spacing said portions, one from the other, for surrounding said projection and interposed between said projection and depression, said elastomeric material providing a shock absorbing connection between the rim portion and the hub portion.

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759,215 COMPLETE SPECIFICATION
1 SHEET This drawing is a reproduction of the Original on a reduced scale.

FIG.1.

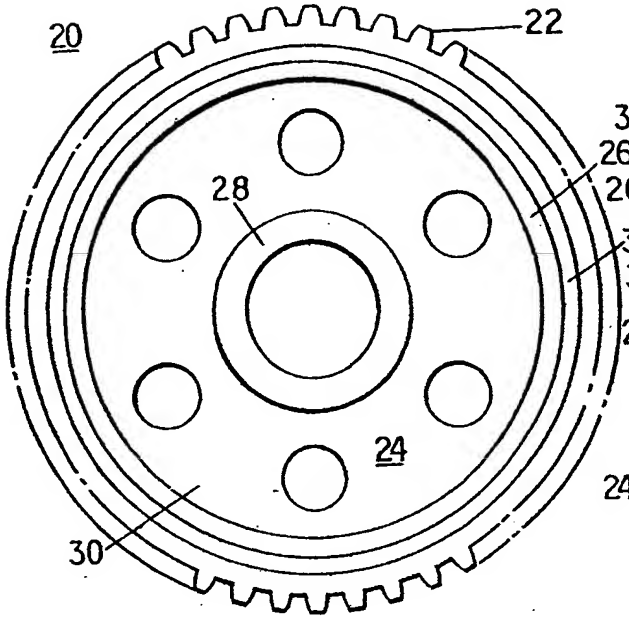

FIG.2.

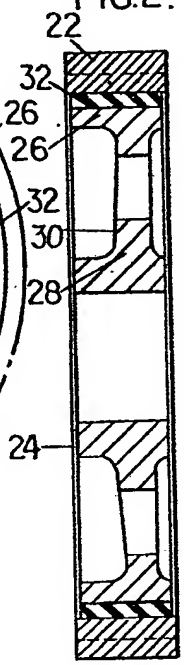

FIG.3.

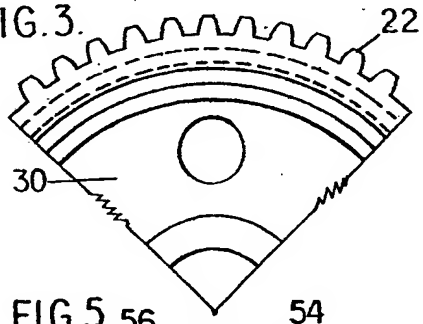

FIG.4.

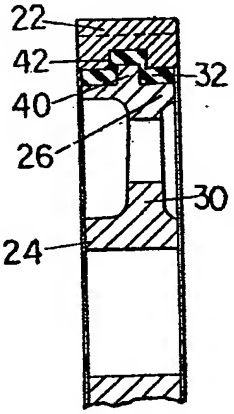

FIG.5.